

2

09/985,927
NGB.177

REMARKS

Entry of this Amendment is proper since it narrows the issues on appeal and does not require further search by the Examiner.

Claims 5-8 are all the claims presently pending in the Application. Claim 5 has been amended to further define the invention. Attached hereto is a marked-up version of the changes made to the specification and claims by the current Amendment.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 5-7 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Tadatomo et al. (JP 7-273367). Claims 5-8 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Yamada (JP 7-169715). Claims 5-7 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Sverdlov (U. S. Patent No. 6,266,355).

These rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

The claimed invention, as recited in claim 5, is directed to a group III nitride compound semiconductor device including a substrate on which a first environment division and a second environment division are formed, and group III nitride compound semiconductor layers formed on the first environment division so as to serve as effective semiconductor layers.

Conventional devices are commonly shaped into square chips. Such devices have sharp corners which cannot reduce a stress applied to a group III nitride compound semiconductor layer, and therefore, do not improve a crystallinity of the layer.

In the claimed invention, on the other hand, the first environment division includes an

09/985,927
NGB.177

outer shape having rounded corners. Unlike the sharp corners of the conventional devices, the rounded corners may relax a stress applied to the group III nitride compound semiconductor layer, thereby improving a crystallinity of the layer.

II. THE PRIOR ART REFERENCES

A. The Tadatomo Reference

The Examiner alleges that Tadatomo teaches the claimed invention. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Tadatomo

Tadatomo discloses a method for manufacturing a high quality semiconductor substrate which has no crack nor other problems and to provide a method for manufacturing a light-emitting device which has a high luminance and a high reliability using that semiconductor substrate (Tadamoto at Abstract).

Applicant submits, however, that Tadatomo does not teach or suggest "*wherein said first environment division comprises an outer shape having rounded corners*" as recited in claim 5.

As explained in the Background section of the Application, conventional devices include a group III nitride compound semiconductor layer formed on a substrate. However, a stress due to a thermal expansion coefficient difference between the group III nitride compound semiconductor layer and the substrate, causes cracks in the group III nitride compound semiconductor layer (Application at page 1, lines 13-23).

In addition, as described on page 11, lines 15-19, a conventional group III nitride compound semiconductor device may be commonly formed in an area having corners with sharp edges. These edges do not relax a stress applied to the group III nitride compound semiconductor layer.

The claimed invention, on the other hand, has a first environment division which includes an outer shape having rounded corners (Application at Figure 3). For example, the first environment division may include a rectangular shape with the corners chamfered (Application at

09/985,927
NGB.177

page 4, lines 24-26). The rounded corners may relax a stress applied to the group III nitride compound semiconductor layer, thereby improving a crystallinity of the layer (Application at page 4, lines 24-28).

Specifically, referring to Figure 3, the Application explains that

~~it is also preferable that corner portions of each opening portion 5A are rounded~~ off. There is a possibility that the growth of group III nitride compound semiconductors may be uneven in right-angled corner. This is further because stress is apt to be concentrated in the right-angled corner portions so that there is a possibility that crystallinity in the corner portions may be spoiled" (Application at page 11, lines 13-19).

Clearly, Tadatomo does not teach or suggest these novel features. Indeed, Tadatomo does not even recognize a problem that the claimed invention may be intended to address. That is, Tadatomo does not even recognize the problem of stress concentrated in right-angled corner portions which may spoil a crystallinity of a group III nitride compound semiconductor layer.

Further, Tadatomo clearly teaches a semiconductor device having right-angled corners. This is clearly shown, for example, in Figure 2 of Tadatomo.

The Examiner attempts to rely on Figures 1-3 of Tadatomo to support his allegations. However, nowhere do these figures disclose a first environment division which includes an outer shape having rounded corners as in the claimed invention. Indeed, as noted above, Figure 2 clearly shows right-angled corners.

Therefore, the Tadatomo device does not solve the problems addressed by the claimed invention. In fact, the Tadatomo device would likely have the same problems discussed in the background section of the Application. That is, the Tadatomo device would likely have stress concentrated in the right-angled corner portions so that there is a possibility that crystallinity in the corner portions may be spoiled.

Therefore, Applicant respectfully submits that the claimed combination is not taught or suggest by Tadatomo. Therefore, the Examiner is respectfully requested to withdraw this

5

09/985,927
NGB.177

rejection.

B. The Yamada Reference

The Examiner alleges that Yamada teaches the claimed invention. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Yamada.

Yamada discloses a method by which the occurrence of cracking and chipping on cut faces can allegedly be prevented and a gallium nitride compound semiconductor wafer using sapphire for its substrate can allegedly be cut into chips of a desired shape and size at a high yield at the time of cutting the wafer into the chips (Yamada at Abstract).

Applicant submits, however, that Yamada does not teach or suggest "*wherein said first environment division comprises an outer shape having rounded corners*" as recited in claim 5.

As noted above, a conventional group III nitride compound semiconductor device may be commonly formed in an area having corners with sharp edges. These edges do not relax a stress applied to the group III nitride compound semiconductor layer.

The claimed invention, on the other hand, has a first environment division which includes an outer shape having rounded corners (Application at Figure 3). For example, the first environment division may include a rectangle shape with the corners chamfered (Application at page 4, lines 24-26). The rounded corners may relax a stress applied to the group III nitride compound semiconductor layer, thereby improving a crystallinity of the layer (Application at page 4, lines 24-28).

Clearly, Yamada does not teach or suggest these novel features. Indeed, Yamada does not even recognize a problem that the claimed invention may be intended to address. That is, Yamada does not even recognize the problem of stress concentrated in right-angled corner portions which may spoil a crystallinity of a group III nitride compound semiconductor layer.

Further, Yamada, like Tadatomo, clearly teaches a semiconductor device having right-angled corners. This is clearly shown, for example, in Figure 5 of Yamada. Indeed, in the

6

09/985,927
NGB.177

Yamada method, linear split grooves 11, 22 are formed in the wafer and the wafer is split into pieces along these grooves. Clearly, this teaches against the use of a rounded corner for improving crysallinity, since such rounded corner may inhibit a clean split along the grooves.

The Examiner attempts to rely on Figures 1-5 of Yamada to support his allegations. Presumably, the Examiner equates all portions of the sapphire substrate 1, other than the slit grooves with the first environment division of the claimed invention. However, this is clearly incorrect, since these portions outside of the grooves 11, 22 clearly do not have rounded corners.

Therefore, the Yamada device does not solve the problems addressed by the claimed invention. In fact, the Yamada device would likely have the same problems discussed in the background section of the Application. That is, the Yamada device would likely have stress concentrated in the right-angled corner portions so that there is a possibility that crvstallinity in the corner portions may be spoiled.

Therefore, Applicant submits that the claimed combination is not taught or suggest by Yamada. Therefore, the Examiner is respectfully requested to withdraw this rejection.

C. The Sverdlov Reference

The Examiner alleges that Sverdlov teaches the claimed invention. However, Applicant respectfully disagrees.

Sverdlov discloses a Group III-V nitride compound semiconductor light emitting device which is constructed without the employing homogeneous layers of AlGa_N. Instead of homogeneous AlGa_N cladding layers, Ga_N cladding layers are utilized. Other techniques are disclosed utilizing digital alloying of cladding layers comprising Ga_N/Al_N superlattices or Al_xGa_{1-x}N/Al_yGa_{1-y}N superlattices, or growing Group III-V nitride devices on selected regions of the growth surface of the substrates so that large stresses are not produced as would be the case with uniform growth over the entire growth surface of the substrate (Sverdlov at Abstract).

Applicant submits, however, that Sverdlov does not teach or suggest "*wherein said first environment division comprises an outer shape having rounded corners*" as recited in claim 5.

7

09/985,927
NGB.177

Clearly, Sverdlov does not teach or suggest these novel features. Indeed, Sverdlov does not even recognize a problem that the claimed invention may be intended to address. That is, Sverdlov does not even recognize the problem of stress concentrated in right-angled corner portions which may spoil a crystallinity of a group III nitride compound semiconductor layer.

Further, Sverdlov, like Yamada and Tadatomo, clearly does not teach a semiconductor device having a first environment division with rounded corners. The Examiner attempts to rely on Figure 4 of Sverdlov to support his allegations. Specifically, the Examiner equates the grooves 33 with a first environment division, and the dielectric 32 with a second environment division. However, nowhere does this figure disclose the grooves 33 has having a "rounded corner".

Indeed, nowhere does Sverdlov disclose that such grooves 33 have a "rounded corner". In fact, with respect to their formation, Sverdlov merely states "[a] patterned exposure is made of the photoresist followed by removal of exposed portions, and etching dielectric in open portions of the resist, as is well known in the art, forming a series of grooves 33 in dielectric layer 32" (Sverdlov at col. 5, lines 52-56). Nowhere does this passage of Sverdlov disclose a fabricating method which would result in a "rounded corner".

Therefore, the Sverdlov device does not solve the problems addressed by the claimed invention. In fact, the Sverdlov device would likely have the same problems discussed in the background section of the Application. That is, the Sverdlov device would likely have stress concentrated in the right-angled corner portions so that there is a possibility that crystallinity in the corner portions may be spoiled

Therefore, Applicant submits that there are elements of the claimed invention that are not taught or suggest by Sverdlov. Therefore, the Examiner is respectfully requested to withdraw this rejection.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 5-8, all the claims presently being

8

09/985,927
NGB.177

examined in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date:

2/28/03Phillip E. Miller
Reg. No. 46,060

McGinn & Gibb, PLLC
8321 Old Courthouse Road, Suite 200
Vienna, VA 22182-3817
(703) 761-4100
Customer No. 21254

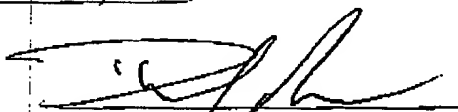
FAX RECEIVED

FEB 28 2003

TECHNOLOGY CENTER 2600

CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that the foregoing Amendment was filed by facsimile with the United States Patent and Trademark Office, Examiner A. Sefer, Group Art Unit # 2826 at fax number (703)-872-9319 this 28th day of February, 2003.

Phillip E. Miller
Reg. No. 46,060

09/985,927
NGB.177

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend the claims to read as follows:

5. (Twice Amended) A group III nitride compound semiconductor device comprising:
a substrate on which a first environment division and a second environment division are formed; and
group III nitride compound semiconductor layers formed on said first environment division so as to serve as effective semiconductor layers,
[wherein the group III nitride compound semiconductor device is produced by a method comprising, in order:
forming the second environment division on a surface of a substrate;
forming a mask on a surface of a first portion of the second environment division;
removing a second portion of the second environment division on which the mask is not formed to thereby form the first environment division in an area in which the mask is not formed;
removing the mask; and laminating a plurality group III nitride compound semiconductor layers for constituting a device on said first environment division]
wherein said first environment division comprises an outer shape having rounded corners.